THE ENGINEERING REORGANIZATION OF FARMS

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It seems apparent that under our agricultural system, as it is now developing, efficiency in farming is becoming more important and that agricultural engineering in all its phases must continue to play an important part in any farming program. It is self-evident that not all engineering equipment, structures, or methods can be recommended for all farms, since we not only have variety in types of farming but also variation within each type. The object of this project which has been called the Engineering Reorganization of Farms is to determine the needs of individual farms for engineering improvements and the benefits which will be derived from their application. While each farm is a problem in itself, it is believed that a study of a number of farms in each agricultural region will yield facts from which generalized conclusions may be drawn.

Surveys of over a hundred farms in seven different states show that many have fields which are nonproductive or partially so because of lack of drainage, soil erosion or the presence of stumps and boulders. In most cases there has been little or no change from the original field arrangement of the farm. The fields are small and frequently irregular in shape, preventing efficient use of tractor-drawn machinery. Buildings

are frequently unadapted to the purpose for which they are used and the location of new buildings is often determined by the availability of space rather than convenience. Power is usually excessive and the machinery frequently obsolete or inefficient.

Preliminary to the inauguration of any project all pertinent facts should be determined as nearly as possible. The physical survey, which is preliminary to a farm development program, develops only a part of the facts which must be considered since physical improvements should be based on a detailed knowledge of the crop rotation, livestock, and other purely agricultural features of the farm program. The farm business must be considered as a unified structure, and each element given its correct proportion in regard to every other element and to the farm business as a whole. Since the planning of purely agricultural features is outside the field of agricultural engineering the cooperation of specialists in these lines has been sought in working out the detailed plans for each farm.

A measure of results will be indicated by the increase in farm income or production as indicated by the farm records, and an increase in efficiency of operation by the saving in time in performing the different farm operations.

The method followed in this work is to draw to scale a map of each farm, showing all details. A crop rotation is determined by the Farm Management authorities and a new field layout is made which includes all areas capable of being developed. These changes are discussed with the farmer and have his approval. The new field layout is plotted on the map giving the farmer a better conception of the problem and enabling him to

work more intelligently. The map is also of value in that it serves as a permanent record of improvements which are made from time to time. A banker who was shown one of these maps by a cooperator became interested in the project and expressed a desire to have a map made of his farm because he realized its value. He no doubt also appreciated the value to the farmer, of a planned farm program in developing the farm to its highest efficiency.

Of the farms now being studied, few were found which had a suitable field arrangement for the area under cultivation. The new field arrangement determined upon materially decreased the number of fields and increased the size so they could be worked efficiently. In some cases there was less fencing material required for the new arrangment than that already on the farm, and there were only a few cases where the purchase of new material was necessary. In a number of cases, the Farm Management authorities found that there was a lack of balance of animal units and possible pasture crops, or a lack of balance in the rotation itself. Under the new plan all phases are balanced with one another.

The power and machinery necessary for operation under the new plan is determined by the type of farming, the area, and the crop rotation. As the developments occur, power or machinery replacements may be made. The amount of change necessary may vary greatly on each farm, depending on the machinery already there, the change in crop rotation, and the speed with which uncultivable areas are improved. Usually the machinery on the farm is sufficient for a time with little need for immediate replacement. It is, however, possible that the immediate purchase or replacement of machinery

may be advisable in some cases. There may be instances where the joint ownership of some types of machinery is feasible and advisable. This will not only reduce the cash outlay but will reduce the overhead expense and make possible full cooperation among the owners to the advantage of all concerned.

The type of power to be used is governed by the location, type of farming, and inclination of the individual farmer. A study of the power used on farms now cooperating in the Minnesota project has shown that in practically all cases there was an excess of power because few, if any, horses were disposed of when a tractor was bought. This no doubt is also true in other states.

Frequently some portion of the farm cannot be cultivated because of the lack of drainage. Those areas which have an outlet are included in the field set up under the new plan. Where there is a single large wet or low area, improvement of which is too costly to be done at one time, plans may be made to lay tile periodically and in such quantities as can be financed by the farmer. Small low or wet areas which prevent the complete cultivation of a field may be drained first since the cost is relatively small and the increase in efficiency large. In cases where there is no outlet and no prospect of one being made available except at excessive cost, the land may be put to some other use. In Minnesota, reed canary grass is frequently recommended for low areas since it will grow under such conditions. Our studies in Minnesota have indicated that many of the drainage ditches which should serve as outlets for tile drains have become filled with sediment or vegetation. Where this condition exists, the tiling

problem becomes rather difficult to solve until it is remedied.

The areas requiring erosion control are indicated on the map and each should be given its proper place in the development program. Since farmers are becoming more erosion conscious and terracing machinery is becoming more readily available at lesser cost, terracing will be done at a much more rapid rate than has been the case in the past. Those areas which are too severely eroded to be included with the cultivable land can well be planted to forest trees to prevent further damage and as a source of building material or fuel. In any case a wood lot stocked with selected species should be included in the new set-up.

While new building occurs infrequently in the life of the average farmer there may be instances where buildings are a major problem. The building sites with the location of each building on the site should be shown on the map. In many cases a change in the floor plan of a building will make it more suitable for the purpose which it is used or may permit the installation of labor and time saving machinery. In some cases plans may be made for the convenient location of new buildings the construction of which is under consideration. Where the reorganization plan is based on a change in the type of farm business, the buildings may require considerable alteration. This happens to be true of a number of farms studied in the Ohio project.

While stumps and boulders are not a major farm problem in the well settled areas, they are occasionally to be found. When present in a field they prevent the efficient use of machinery and may be the cause of damage or breakage. Early removal of these should be considered in the reorgani-

zation plan. Where the removal of trees is necessary, this should be done as soon as possible to permit at least partial decay of the stumps before removing them.

In many cases the new field arrangement does not require the purchase of new fencing material and in some cases there may be a surplus. Since fence changes do not usually require the immediate purchase of new material, they can be made readily.

Considering the problems just enumerated, it can be seen that the development of a reorganization plan in an orderly and progressive manner is a problem which requires considerable forethought and planning. Each phase must be given its proper place depending on cost and need. Estimated costs of each type of improvement is of considerable help in working out the program for each farm.

In addition to farm reorganization project for the developed sections, is one for the cutover sections. This project is one of organization rather than reorganization. The procedure in this case also includes a map showing all details including size and amount of brush and stumps. Areas of such size as can be cleared each year will be laid out so that the total amount of cleared land together with the crop rotation, power, machinery, etc., any given year will be known. This will permit planning for the purchase of explosives, crop rotations, the purchase of new machinery, and the construction of buildings. The plan will include the location of the buildings site together with the proposed location of all buildings so that as each is constructed it will occupy its permanent position. The thought is that where a building is to be used temporarily for

some other purpose than intended, it should be of such design that changes can be made at little cost. The project offers a splendid opportunity to study the progress made by the settler under a definite plan and to determine how the time involved in working the gradually increasing cultivated acreage will affect the rate of clearing. If clearing cost records are kept, it will make a splendid opportunity to obtain this data under conditions such as the settler works. Since farm cost account records will be kept, economic studies will also be made.

Economic conditions during the past four years have not been favorable for farm improvements on a very large scale; however, some tiling has been done and a serious effort has been made by our cooperators to at least make such changes which require the expenditure only of labor. Each year a progress map has been made for each cooperator. This map shows the acreage and location of each crop grown and the improvements made. It also serves as a permanent record to which the cooperator may refer in later years.

In both of these projects the development of a good plan is essential but equally important is that the plan be followed as nearly as conditions will permit. The rate of change from the old to the new will be governed by the conditions prevailing on each farm and will vary accordingly. The full cooperation of the farmer will be more readily gained if he fully understands what is being attempted. It is needless to say that any changes which are contemplated must have his approval, however, if the value of the changes are apparent, few cooperators will fail to follow them.